

## Industrial Consultancy & Sponsored Research (IC&SR)

### Fuel Injector with Cartridge based Heating Element IITM Technology Available for Licensing

#### PROBLEM STATEMENT

- ❖ The **Transportation sector's** reliance on **petroleum-based fuels** contributes to **poor air quality**.
- ❖ Compression Ignition (CI) engines aim to use cleaner, **renewable fuels** like natural gas, propane, methanol, hydrogen, reformulated gasoline, and biodiesel.
- ❖ **Biodiesel** is a **promising renewable fuel** for automotive engines due to its **low greenhouse gas emissions**, complete combustion, and energy density.
- ❖ However, its **effective utilization in diesel engines is limited** due to its poor physical properties, which affect fuel-air mixture preparation and homogeneity.
- ❖ There is a need for **suitable fuel vaporization technique** that is economical, operates with less energy input and **compatible with high viscous, low volatile biodiesel fuels**.

#### TECHNOLOGY CATEGORY MARKET

**Technology:** Fuel Injector with Cartridge based Heating Element

**Category:** Automobile & Transportation

**Industry:** Automotive

**Application:** IC Engine

**Market:** The global market starting at **USD 68 Billion in 2023**, the "Automotive Fuel Injector Market" is expected to soar to **USD 104.23 Billion by 2031**, with an impressive compound annual growth rate (CAGR) of **6.29% from 2024 to 2031**.

#### INTELLECTUAL PROPERTY

IITM IDF Ref. 2074, Patent No: IN 539702

#### TRL (Technology Readiness Level)

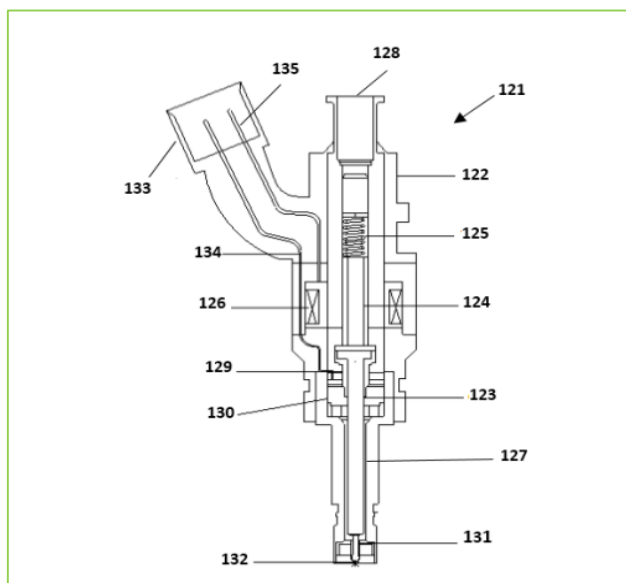
TRL-4, Experimentally validated in Lab;

#### Research Lab

Prof. K Anand, Dept. of Mechanical Eng.

#### TECHNOLOGY

#### Diagram



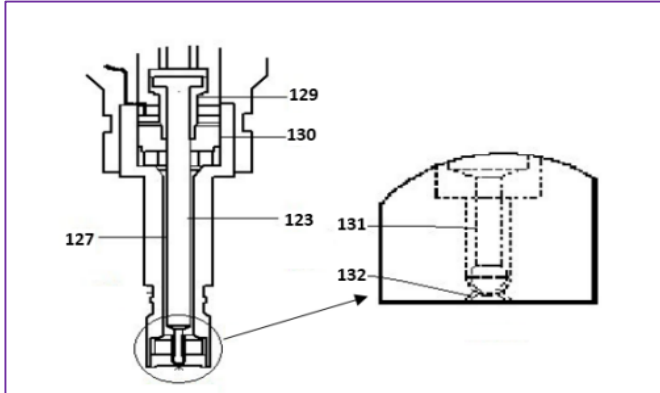
Numerals	Description
121	fuel injection system
122	injector housing
123	cartridge heater
124	plunger
125	valve spring
126	electromagnetic coils
127	carved fuel passage
128	fuel supply line
129	heater block
130	terminal block
131	injector nozzle tip
132	plurality of orifices
133	power supply system
134	heater terminal
135	injector terminal

#### CONTACT US

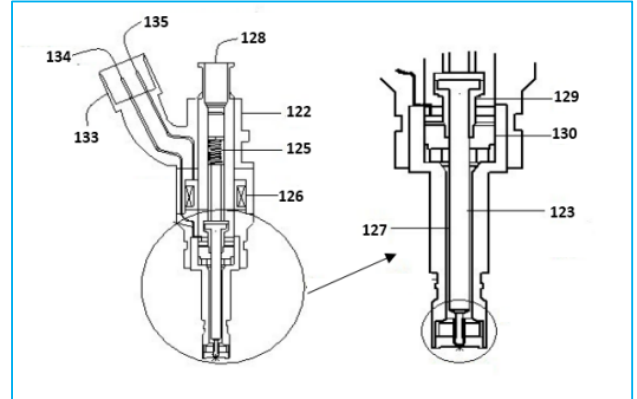
Dr. Dara Ajay, Head TTO  
Technology Transfer Office,  
IPM Cell- IC&SR, IIT Madras

IITM TTO Website:  
<https://ipm.icsr.in/ipm/>

Email: [smipm-icsr@icsrpis.iitm.ac.in](mailto:smipm-icsr@icsrpis.iitm.ac.in)  
[sm-marketing@imail.iitm.ac.in](mailto:sm-marketing@imail.iitm.ac.in)  
Phone: +91-44-2257 9756/ 9719



The above drawing shows a exploded view of the cartridge heater (123)



The above drawing shows a exploded view of the injector nozzle tip (131)

### Key Features / Value Proposition

#### Efficiency

- Uses flash heating of the high viscous fuel thereby increasing the efficiency of fuel-air mixing process and spray characteristics.

#### Compatible of fuels

- Heated tip injector of the present invention is compatible with for all **15 types of liquid fuels**.

#### Retrofittable

- electromagnetic fuel injector fitted with cartridge heater (123) is **retrofittable to the existing commercial-off-the-shelf direct fuel injector**.

#### Controlling of temperature

- the temperature of the said cartridge heater (123) is controlled by means of an **external circuit to avoid excessive heating**.

#### Maintaining of fuel supply

- the fuel supply is maintained at a **constant volume** based on the capacity of the said carved fuel passage (127) and the duration of the nozzle
- lift deciding the amount of fuel being injected into the fuel injection system.
- appropriate for vapour injection **avoiding restricted fuel supply**
- cartridge heater (123) is positioned **not to interfere** with the electromagnetic solenoid actuation system

#### Viscosity Properties

- fuel inside the said carved fuel passage (127) **results in lower viscosity** thereby enabling **homogeneous charge preparation** with least input of electrical energy

#### plunger (124)

- **electromagnetic solenoid plunger**.

#### cartridge heater shape

- **spindle shape**

### CONTACT US

Dr. Dara Ajay, Head TTO  
Technology Transfer Office,  
IPM Cell- IC&SR, IIT Madras

IITM TTO Website:  
<https://ipm.icsr.in/ipm/>

Email: [smipm-icsr@icsrpis.iitm.ac.in](mailto:smipm-icsr@icsrpis.iitm.ac.in)

[sm-marketing@imail.iitm.ac.in](mailto:sm-marketing@imail.iitm.ac.in)

Phone: +91-44-2257 9756/ 9719